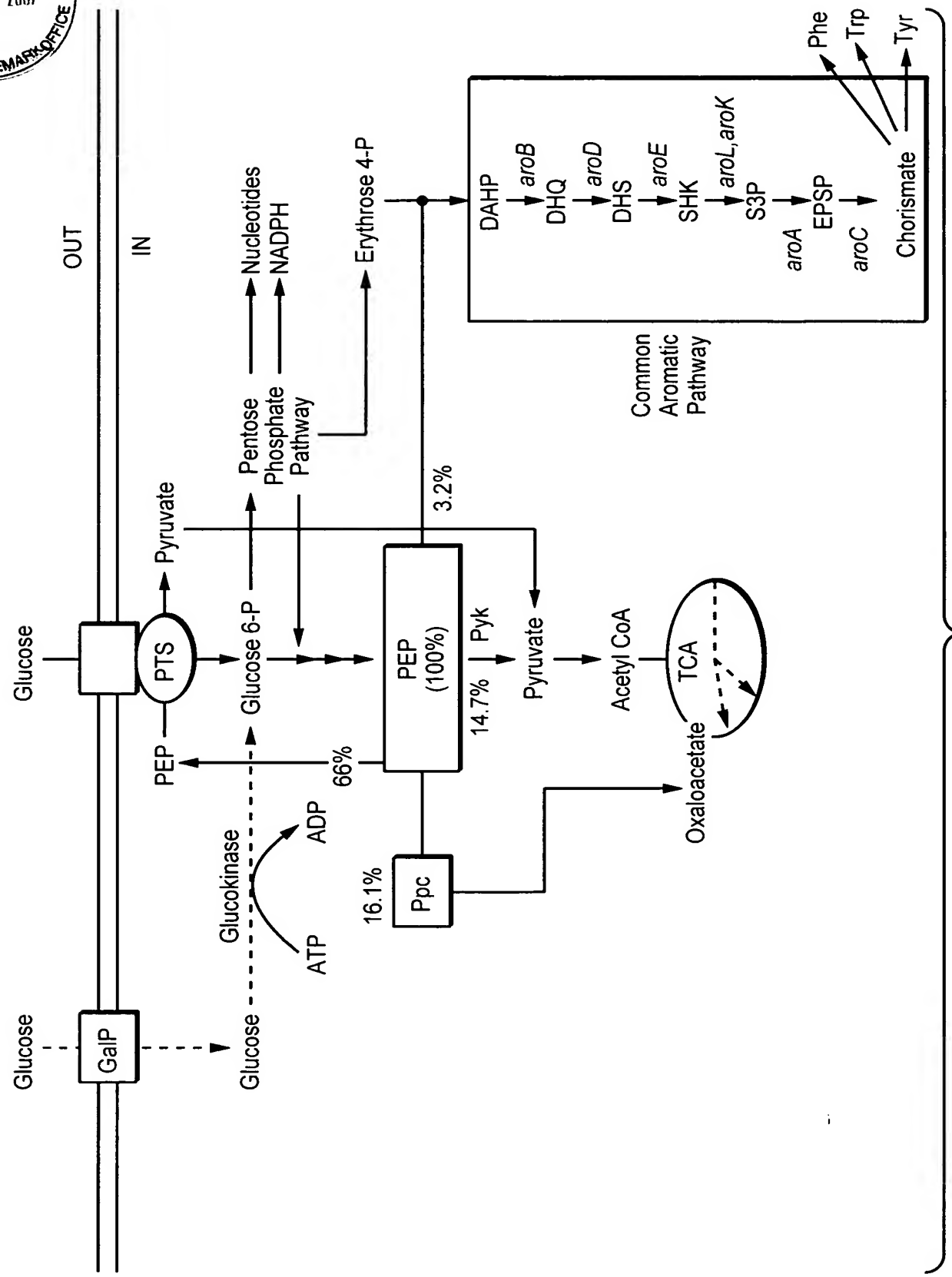


FIG. 1A

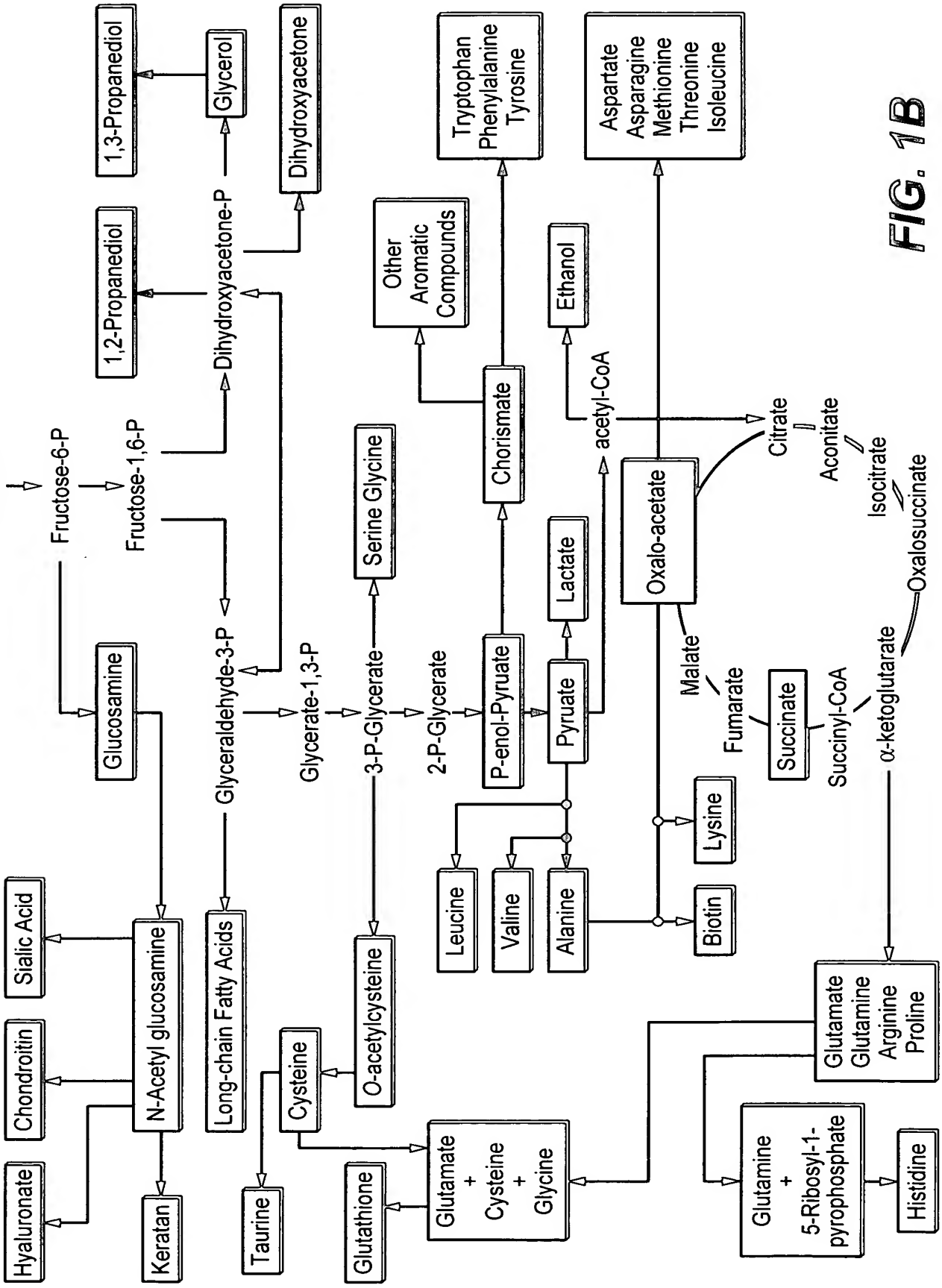

Glucose
Fructose-6-P
Fructose-1,6-P
Glucosamine
Glyceraldehyde-3-P
Glycerate-1,3-P
3-P-Glycerate
2-P-Glycerate
P-enol-Pyruate
Pyruate
Lactate
acetyl-CoA
Oxalo-acetate
Citrate
Aconitate
Isocitrate
Oxalosuccinate
α-ketoglutarate
Succinyl-CoA
Succinate
Fumarate
Malate
Dihydroxyacetone-P
Dihydroxyacetone
Glycerol
1,3-Propanediol
1,2-Propanediol
Serine Glycine
Chorismate
Other Aromatic Compounds
Tryptophan Phenylalanine Tyrosine
Ethanol
Aspartate Asparagine Methionine Threonine Isoleucine
Lysine
Biotin
Leucine
Valine
Alanine
Sialic Acid
Chondroitin
Hyaluronate
N-Acetyl glucosamine
Keratan
Long-chain Fatty Acids
Cysteine
Taurine
O-acetylcysteine
Glutathione
Glutamate + Cysteine + Glycine
Glutamate Glutamine Arginine Proline
Glutamine + 5-Ribosyl-1-pyrophosphate
Histidine

FIG. 1B

TCGGTTTTCACAGTTGTTACATTTCTTTTCAGTAAAGTCTGGATGCATATGGCGGCCGC***ATAA***
CTTCGTATAGCATACATTATACGAAGTTATCTAGAGTTGCATGCCTGCAGGTCCGAATTTCTG
CCATTCATCCGCTTATTATCACTTATTCAGGCGTAGCACCAGGCGTTTAAGGGCACCAATAAC
TGCCTTAAAAAAA**TTACGCCCCGCCCTGCCACTCATCGCAGTACTGTTGTAATTCATTAAGCA**
TTCTGCCGACATGGAAGCCATCACAAACGGCATGATGAACCTGAATCGCCAGCGGCATCAGCA
CCTTGTCGCCTTGCGTATAATATTTGCCCATGGTGAAAACGGGGGCGAAGAAGTTGTCCATAT
TGGCCACGTTTAAATCAAAACTGGTGAAACTCACCCAGGGATTGGCTGAGACGAAAAACATAT
TCTCAATAAACCCTTTAGGGAAATAGGCCAGGTTTTCACCGTAACACGCCACATCTTGCGAAT
ATATGTGTAGAAACTGCCGGAAATCGTCGTGGTATTCACTCCAGAGCGATGAAAACGTTTCAG
TTTGCTCATGGAAAACGGTGTAACAAGGGTGAACACTATCCCATATCACCAGCTCACCGTCTT
TCATTGCCATACGGAATTCCGGATGAGCATTCATCAGGCGGGCAAGAATGTGAATAAAGGCCG
GATAAAACTTGTGCTTATTTTTCTTTACGGTCTTTAAAAAGGCCGTAATATCCAGCTGAACGG
TCTGGTTATAGGTACATTGAGCAACTGACTGAAATGCCTCAAAATGTTCTTTACGATGCCATT
GGGATATATCAACGGTGGTATATCCAGTGATTTTTTTCTCCATTTTAGCTTCCTTAGCTCCTG
AAAATCTCGATAACTCAAAAAATACGCCCGGTAGTGATCTTATTTCATTATGGTGAAAGTTGG
AACCTCTTACGTGCCGATCAACGTCTCATTTTCGCCAAAAGTTGGCCCAGGGCTTCCCGGTAT
CAACAGGGACACCAGGATTTATTTATTCTGCGAAGTGATCTTCCGTCACAGGTATTTATTCGG
ACTC***TAGATAACTTCGTATAGCATACATTATACGAAGTTAT***GGATCATGGCTGTGCAGGTCGT
AAATCACTGCATAATTCGTGTCGCTCAAGGCGCACTCCCGTTCTGGATAATGTTTTTTGCGCC
GACATCATAACGGTTCTGGCAAATATTCTGAAATGAGCTGTTGACAATTAATCATCCGGCTCG
TATAATGTGTGG*AATTGTGAGCGGATAACAATTT*CACACAGGAAACAGACTAATTCACAATAA
AAAATAACCATATTGGAGGGCATC**ATG**

FIG. 2

CAGCAGTGGTGGTGATCGGTTTTGGCTGGGGCCCCTCCCCGCACCGGAGGCCGATTACAGCCAA
CCACAACAGGCAAAGGGTTTGGAAGATATTCATATTATTATTGCGGTTGTCACAGTTGTTACAT
TTCTTTTCAGTAAAGTCTGGATG*CATATGGCGGCCGCATAACTTCGTATAGCATACATTATACG*
*AAGTTAT****GGATCATGGCTGTGCAGGTCGTAAATCACTGCATAATTGGTGTCGCTCAAGGCGCAC***
TCCCGTTCTGGATAATGTTTTTTGCGCCGACATCATAACGGTTCTGGCAAATATTCTGAAATGA
GCTGTTGACA***ATTAATCATCCGGCTCG***TATAAT***GTGTGGCATTG***

FIG. 3

ACTTAGTTTGCCCAGCTTGCAAAAAGGCATCGCTGCAATTGGATGCATATGGCGGCCGC***ATAA***
CTTCGTATAGCATACATTATACGAAGTTATCTAGAGTTGCATGCCTGCAGGTCCGAATTTCTG
CCATTCATCCGCTTATTATCACTTATTCAGGCGTAGCACCAGGCGTTTAAGGGCACCAATAAC
TGCCTTAAAAAAA**TTACGCCCCGCCCTGCCACTCATCGCAGTACTGTTGTAATTCATTAAGCA**
TTCTGCCGACATGGAAGCCATCACAAACGGCATGATGAACCTGAATCGCCAGCGGCATCAGCA
CCTTGTCGCCTTGCGTATAATATTTGCCCATGGTGAAAACGGGGGCGAAGAAGTTGTCCATAT
TGGCCACGTTTAAATCAAAACTGGTGAAACTCACCCAGGGATTGGCTGAGACGAAAAACATAT
TCTCAATAAACCCTTTAGGGAAATAGGCCAGGTTTTCACCGTAACACGCCACATCTTGCGAAT
ATATGTGTAGAAACTGCCGGAAATCGTCGTGGTATTCACTCCAGAGCGATGAAAACGTTTCAG
TTTGCTCATGGAAAACGGTGTAACAAGGGTGAACACTATCCCATATCACCAGCTCACCGTCTT
TCATTGCCATACGGAATTCCGGATGAGCATTCATCAGGCGGGCAAGAATGTGAATAAAGGCCG
GATAAAACTTGTGCTTATTTTTCTTTACGGTCTTTAAAAAGGCCGTAATATCCAGCTGAACGG
TCTGGTTATAGGTACATTGAGCAACTGACTGAAATGCCTCAAAATGTTCTTTACGATGCCATT
GGGATATATCAACGGTGGTATATCCAGTGATTTTTTTCTCCATTTTAGCTTCCTTAGCTCCTG
AAAATCTCGATAACTCAAAAAATACGCCCGGTAGTGATCTTATTTCATTATGGTGAAAGTTGG
AACCTCTTACGTGCCGATCAACGTCTCATTTTCGCCAAAAGTTGGCCCAGGGCTTCCCGGTAT
CAACAGGGACACCAGGATTTATTTATTCTGCGAAGTGATCTTCCGTCACAGGTATTTATTCGG
ACTC***TAGATAACTTCGTATAGCATACATTATACGAAGTTAT***GGATCATGGCTGTGCAGGTCGT
AAATCACTGCATAATTCGTGTCGCTCAAGGCGCACTCCCGTTCTGGATAATGTTTTTTGCGCC
GACATCATAACGGTTCTGGCAAATATTCTGAAATGAGCTGCTTGACAATTAATCATCCGGCTC
GTATAATGTGTGG*AATTGTGAGCGGATAACAATTT*CACACAGGAAACAGACGAGAAAGAATTA
TTTTGACTTTAGCGGAGCAGTTGAAGA**ATG**

FIG. 4

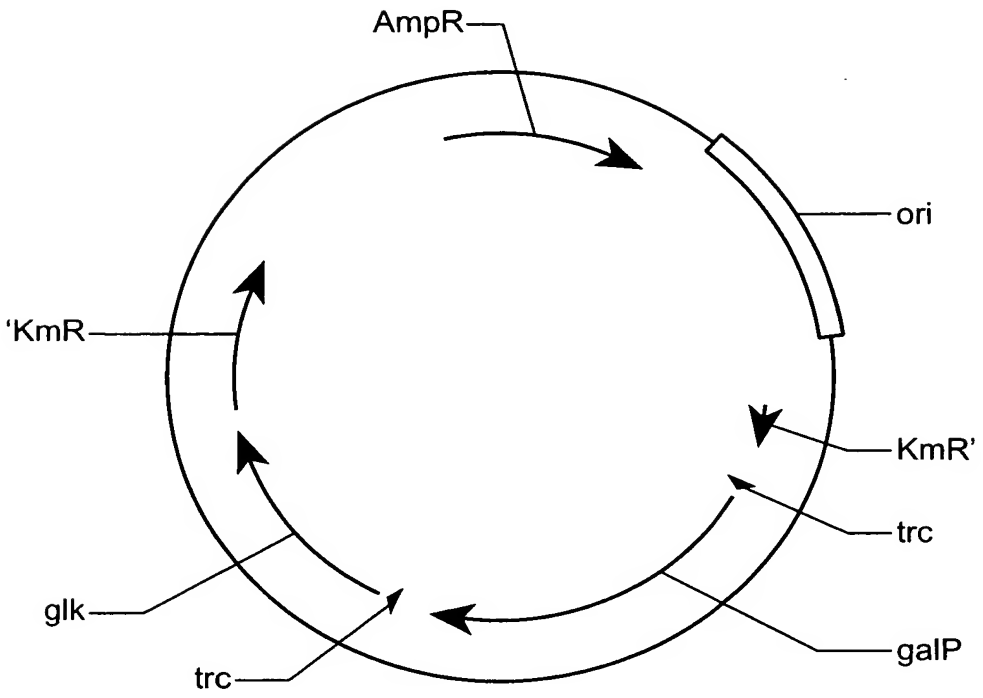

AmpR
ori
'KmR
KmR'
trc
glk
galP
trc

FIG. 5

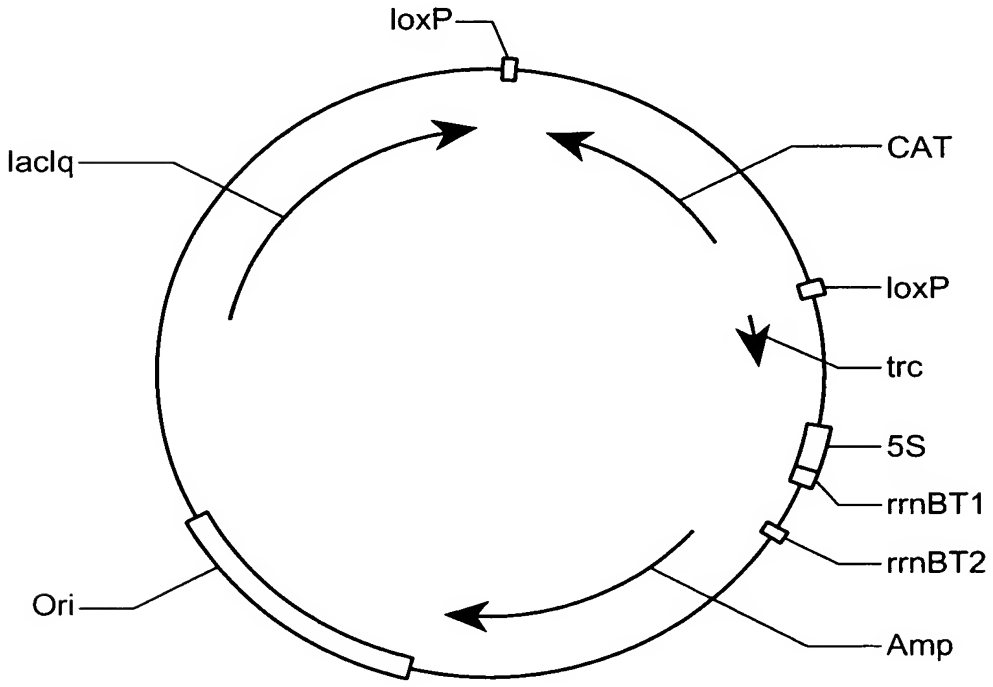

loxP
lacIq
CAT
loxP
trc
5S
rrnBT1
rrnBT2
Ori
Amp

FIG. 6

FIG. 7A

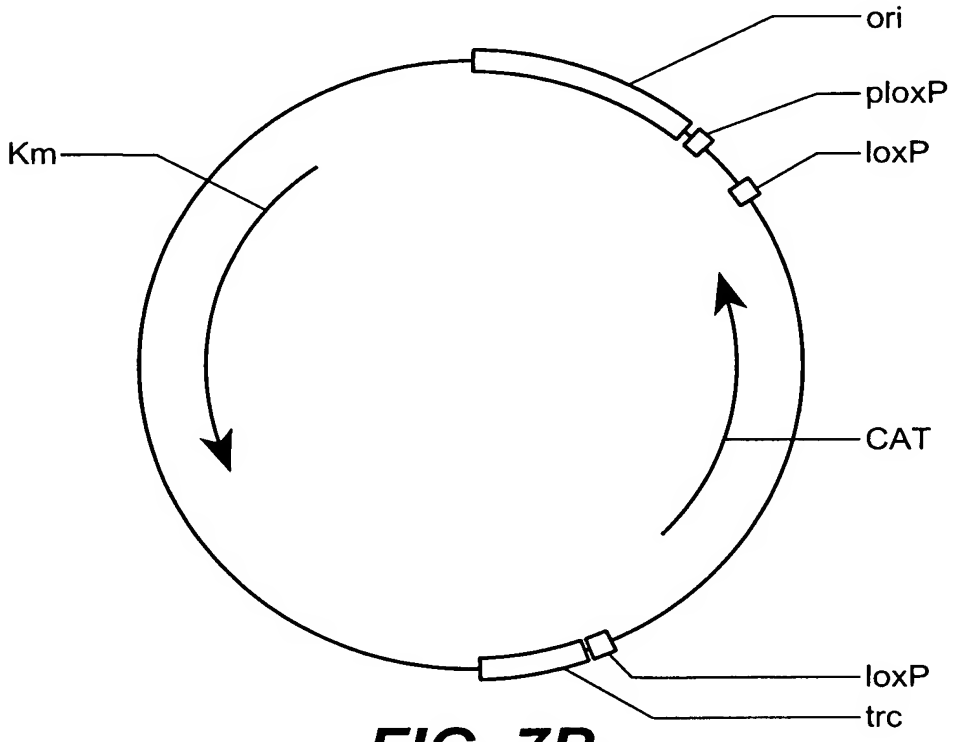


FIG. 7B

TAGTAAAGCCCTCGCTAGATTTTAATGCGGATGTTGCGATTACTTCGCCAACTATTGCGATAAC
AAGAAAAAGCCAGCCTTTCATGATATATCTCCCAATTTGTGTAGGGCTTATTATGCACGCTTAA
AAATAATAAAAGCAGACTTGACCTGATAGTTTGGCTGTGAGCAATTATGTGCTTAGTGCATCTA
ACGCTTGAGTTAAGCCGCGCCGCGAAGCGGCGTCGGCTTGAACGAATTGTTAGACATTATTTGC
CGACTACCTTGGTGATCTCGCCTTTCACGTAGTGGACAAATTCTTCCAACTGATCTGCGCGCGA
GGCCAAGCGATCTTCTTCTTGTCCAAGATAAGCCTGTCTAGCTTCAAGTATGACGGGCTGATAC
TGGGCCGGCAGGCGCTCCATTGCCCAGTCGGCAGCGACATCCTTCGGCGCGATTTTGCCGGTTA
CTGCGCTGTACCAAATGCGGGACAACGTAAGCACTACATTTCGCTCATCGCCAGCCCAGTCGGG
CGGCGAGTTCCATAGCGTTAAGGTTTCATTTAGCGCCTCAAATAGATCCTGTTCAGGAACCGGA
TCAAAGAGTTCCTCCGCCGCTGGACCTACCAAGGCAACGCTATGTTCTCTTGCTTTTGTCAGCA
AGATAGCCAGATCAATGTCGATCGTGGCTGGCTCGAAGATACCTGCAAGAATGTCATTGCGCTG
CCATTCTCCAAATTGCAGTTCGCGCTTAGCTGGATAACGCCACGGAATGATGTCGTCGTGCACA
ACAATGGTGACTTCTACAGCGCGGAGAATCTCGCTCTCTCCAGGGGAAGCCGAAGTTTCCAAAA
GGTCGTTGATCAAAGCTCGCCGCGTTGTTTCATCAAGCCTTACGGTCACCGTAACCAGCAAATC
AATATCACTGTGTGGCTTCAGGCCGCCATCCACTGCGGAGCCGTACAAATGTACGGCCAGCAAC
GTCGGTTCGAGATGGCGCTCGATGACGCCAACTACCTCTGATAGTTGAGTCGATACTTCGGCGA
TCACCGCTTCCCTCATGATGTTTAACTTTGTTTTAGGGCGACTGCCCTGCTGCGTAACATCGTT
GCTGCTCCATAACATCAAACATCGACCCACGGCGTAACGCGCTTGCTGCTTGGATGCCCGAGGC
ATAGACTGTACCCCAAAAAAACAGTCATAACAAGCCATGAAAACCGCCACTGCGCCGTTACCAC
CGCTGCGTTCGGTCAAGGTTCTGGACCAGTTGCGTGAGCGCATACGCTACTTGCATTACAGCTT
ACGAACCGAACAGGCTTATGTCCACTGGGTTCGTGCCTTCATCCGTTTCCACGGTGTGCGTCAC
CCGGCAACCTTGGGCAGCAGCGAAGTCGAGGCATTTCTGTCCTGGCTGGCGAACGAGCGCAAGG
TTTCGGTCTCCACGCATCGTCAGGCATTGGCGGCCTTGCTGTTCTTCTACGGCAAGGTGCTGTG
CACGGATCTGCCCTGGCTTCAGGAGATCGGAAGACCTCGGCCGTCGCGGCGCTTGCCGGTGGTG
CTGACCCCGGATGAAGTGGTTCGCATCCTCGGTTTTCTGGAAGGCGAGCATCGTTTGTTCGCCC
AGCTTCTGTATGGAACGGGCATGCGGATCAGTGAGGGTTTGCAACTGCGGGTCAAGGATCTGGA
TTTCGATCACGGCACGATCATCGTGCGGGAGGGCAAGGGCTCCAAGGATCGGGCCTTGATGTTA
CCCGAGAGCTTGGCACCCAGCCTGCGCGAGCAGGGGAATTAATTCCCACGGGTTTTGCTGCCCG
CAAACGGGCTGTTCTGGTGTTGCTAGTTTGTTATCAGAATCGCAGATCCGGCTTCAGCCGGTTT
GCCGGCTGAAAGCGCTATTTCTTCCAGAATTGCCATGATTTTTTCCCCACGGGAGGCGTCACTG
GCTCCCGTGTTGTCGGCAGCTTTGATTCGATAAGCAGCATCGCCTGTTTCAGGCTGTCTATGTG
TGACTGTTGAGCTGTAACAAGTTGTCTCAGGTGTTCAATTTCATGTTCTAGTTGCTTTGTTTTA
CTGGTTTCACCTGTTCTATTAGGTGTTACATGCTGTTCATCTGTTACATTGTCGATCTGTTCAT
GGTGAACAGCTTTGAATGCACCAAAAACTCGTAAAAGCTCTGATGTATCTATCTTTTTTACACC
GTTTTCATCTGTGCATATGGACAGTTTTCCCTTTGATATGTAACGGTGAACAGTTGTTCTACTT
TTGTTTGTTAGTCTTGATGCTTCACTGATAGATACAAGAGCCATAAGAACCTCAGATCCTTCCG
TATTTAGCCAGTATGTTCTCTAGTGTGGTTCGTTGTTTTTGCGTGAGCCATGAGAACGAACCAT
TGAGATCATACTTACTTTGCATGTCACTCAAAAATTTTGCCTCAAAACTGGTGAGCTGAATTTT
TGCAGTTAAAGCATCGTGTAGTGTTTTTCTTAGTCCGTTATGTAGGTAGGAATCTGATGTAATG
GTTGTTGGTATTTTGTCACCATTCATTTTTATCTGGTTGTTCTCAAGTTCGGTTACGAGATCCA
TTTGTCTATCTAGTTCAACTTGGAAAATCAACGTATCAGTCGGGCGGCCTCGCTTATCAACCAC
CAATTTCATATTGCTGTAAGTGTTTAAATCTTTACTTATTGGTTTCAAAACCCATTGGTTAAGC
CTTTTAAACTCATGGTAGTTATTTTCAAGCATTAACATGAACTTAAATTCATCAAGGCTAATCT
CTATATTTGCCTTGTGAGTTTTCTTTTGTGTTAGTTCTTTTAATAACCACTCATAAATCCTCAT
AGAGTATTTGTTTTCAAAAGACTTAACATGTTCCAGATTATATTTTATGAATTTTTTTAACTGG
AAAAGATAAGGCAATATCTCTTCACTAAAAACTAATTCTAATTTTTCGCTTGAGAACTTGGCAT

FIG. 8A

AGTTTGTCCACTGGAAAATCTCAAAGCCTTTAACCAAAGGATTCCTGATTTCCACAGTTCTCGT
CATCAGCTCTCTGGTTGCTTTAGCTAATACACCATAAGCATTTTCCCTACTGATGTTCATCATC
TGAGCGTATTGGTTATAAGTGAACGATACCGTCCGTTCTTTCCTTGTAGGGTTTTCAATCGTGG
GGTTGAGTAGTGCCACACAGCATAAAATTAGCTTGGTTTCATGCTCCGTTAAGTCATAGCGACT
AATCGCTAGTTCATTTGCTTTGAAAACAACTAATTCAGACATACATCTCAATTGGTCTAGGTGA
TTTTAATCACTATACCAATTGAGATGGGCTAGTCAATGATAATTACTAGTCCTTTTCCTTTGAG
TTGTGGGTATCTGTAAATTCTGCTAGACCTTTGCTGGAAAACTTGTAAATTCTGCTAGACCCTC
TGTAAATTCCGCTAGACCTTTGTGTGTTTTTTTTGTTTATATTCAAGTGGTTATAATTTATAGA
ATAAAGAAAGAATAAAAAAAGATAAAAAGAATAGATCCCAGCCCTGTGTATAACTCACTACTTT
AGTCAGTTCCGCAGTATTACAAAAGGATGTCGCAAACGCTGTTTGCTCCTCTACAAAACAGACC
TTAAAACCCTAAAGGCTTAAGTAGCACCCTCGCAAGCTCGGGCAAATCGCTGAATATTCCTTTT
GTCTCCGACCATCAGGCACCTGAGTCGCTGTCTTTTTCGTGACATTCAGTTCGCTGCGCTCACG
GCTCTGGCAGTGAATGGGGGTAAATGGCACTACAGGCGCCTTTTATGGATTCATGCAAGGAAAC
TACCCATAATACAAGAAAAGCCCGTCACGGGCTTCTCAGGGCGTTTTATGGCGGGTCTGCTATG
TGGTGCTATCTGACTTTTTGCTGTTCAGCAGTTCCTGCCCTCTGATTTTCCAGTCTGACCACTT
CGGATTATCCCGTGACAGGTCATTCAGACTGGCTAATGCACCCAGTAAGGCAGCGGTATCATCA
ACAGGCTTACCCGTCTTACTGTCGGGAATTCATTTAAATAGTCAAAAGCCTCCGACCGGAGGCT
TTTGACTGCTAGGCGATCTGTGCTGTTTGCCACGGTATGCAGCACCAGCGCGAGATTATGGGCT
CGCACGCTCGACTGTCGGACGGGGGCACTGGAACGAGAAGTCAGGCGAGCCGTCACGCCCTTGA
CAATGCCACATCCTGAGCAAATAATTCAACCACTAAACAAATCAACCGCGTTTCCCGGAGGTAA
CCAAGCTTGCGGGAGAGAATGATGAACAAGAGCCAACAAGTTCAGACAATCACCCTGGCCGCCG
CCCAGCAAATGGCGGCGGCGGTGGAAAAAAAAGCCACTGAGATCAACGTGGCGGTGGTGTTTTC
CGTAGTTGACCGCGGAGGCAACACGCTGCTTATCCAGCGGATGGACGAGGCCTTCGTCTCCAGC
TGCGATATTTCCCTGAATAAAGCCTGGAGCGCCTGCAGCCTGAAGCAAGGTACCCATGAAATTA
CGTCAGCGGTCCAGCCAGGACAATCTCTGTACGGTCTGCAGCTAACCAACCAACAGCGAATTAT
TATTTTTGGCGGCGGCCTGCCAGTTATTTTTAATGAGCAGGTAATTGGCGCCGTCGGCGTTAGC
GGCGGTACGGTCGAGCAGGATCAATTATTAGCCCAGTGCGCCCTGGATTGTTTTTCCGCATTAT
AACCTGAAGCGAGAAGGTATATTATGAGCTATCGTATGTTCCGCCAGGCATTCTGAGTGTTAAC
GAGGGGACCGTCATGTCGCTTTCACCGCCAGGCGTACGCCTGTTTTACGATCCGCGCGGGCACC
ATGCCGGCGCCATCAATGAGCTGTGCTGGGGGCTGGAGGAGCAGGGGGTCCCCTGCCAGACCAT
AACCTATGACGGAGGCGGTGACGCCGCTGCGCTGGGCGCCCTGGCGGCCAGAAGCTCGCCCCTG
CGGGTGGGTATCGGGCTCAGCGCGTCCGGCGAGATAGCCCTCACTCATGCCCAGCTGCCGGCGG
ACGCGCCGCTGGCTACCGGACACGTCACCGATAGCGACGATCAACTGCGTACGCTCGGCGCCAA
CGCCGGGCAGCTGGTTAAAGTCCTGCCGTTAAGTGAGAGAAACTGAATGTATCGTATCTATACC
CGCACCGGGGATAAAGGCACCACCGCCCTGTACGGCGGCAGCCGCATCGAGAAAGACCATATTC
GCGTCGAGGCCTACGGCACCGTCGATGAACTGATATCCCAGCTGGGCGTCTGCTACGCCACGAC
CCGCGACGCCGGGCTGCGGGAAAGCCTGCACCATATTCAGCAGACGCTGTTCGTGCTGGGGGCT
GAACTGGCCAGCGATGCGCGGGGCCTGACCCGCCTGAGCCAGACGATCGGCGAAGAGGAGATCA
CCGCCCTGGAGCGGCTTATCGACCGCAATATGGCCGAGAGCGGCCCGTTAAAACAGTTCGTGAT
CCCGGGGAGGAATCTCGCCTCTGCCCAGCTGCACGTGGCGCGCACCCAGTCCCGTCGGCTCGAA
CGCCTGCTGACGGCCATGGACCGCGCGCATCCGCTGCGCGACGCGCTCAAACGCTACAGCAATC
GCCTGTCGGATGCCCTGTTCTCCATGGCGCGAATCGAAGAGACTAGGCCTGATGCTTGCGCTTG
AACTGGCCTAGCAAACACAGAAAAAAGCCCGCACCTGACAGTGCGGGCTTTTTTTTTCCTAGGC
GATCTGTGCTGTTTGCCACGGTATGCAGCACCAGCGCGAGATTATGGGCTCGCACGCTCGACTG
TCGGACGGGGGCACTGGAACGAGAAGTCAGGCGAGCCGTCACGCCCTTGACAATGCCACATCCT
GAGCAAATAATTCAACCACTAAACAAATCAACCGCGTTTCCCGGAGGTAACCAAGCTTCACCTT

FIG. 8B

TTGAGCCGATGAACAATGAAAAGATCAAAACGATTTGCAGTACTGGCCCAGCGCCCCGTCAATC
AGGACGGGCTGATTGGCGAGTGGCCTGAAGAGGGGCTGATCGCCATGGACAGCCCCTTTGACCC
GGTCTCTTCAGTAAAAGTGGACAACGGTCTGATCGTCGAACTGGACGGCAAACGCCGGGACCAG
TTTGACATGATCGACCGATTTATCGCCGATTACGCGATCAACGTTGAGCGCACAGAGCAGGCAA
TGCGCCTGGAGGCGGTGGAAATAGCCCGTATGCTGGTGGATATTCACGTCAGCCGGGAGGAGAT
CATTGCCATCACTACCGCCATCACGCCGGCCAAAGCGGTCGAGGTGATGGCGCAGATGAACGTG
GTGGAGATGATGATGGCGCTGCAGAAGATGCGTGCCCGCCGGACCCCCTCCAACCAGTGCCACG
TCACCAATCTCAAAGATAATCCGGTGCAGATTGCCGCTGACGCCGCCGAGGCCGGGATCCGCGG
CTTCTCAGAACAGGAGACCACGGTCGGTATCGCGCGCTACGCGCCGTTTAACGCCCTGGCGCTG
TTGGTCGGTTCGCAGTGCGGCCGCCCCGGCGTGTTGACGCAGTGCTCGGTGGAAGAGGCCACCG
AGCTGGAGCTGGGCATGCGTGGCTTAACCAGCTACGCCGAGACGGTGTCGGTCTACGGCACCGA
AGCGGTATTTACCGACGGCGATGATACGCCGTGGTCAAAGGCGTTCCTCGCCTCGGCCTACGCC
TCCCGCGGGTTGAAAATGCGCTACACCTCCGGCACCGGATCCGAAGCGCTGATGGGCTATTCGG
AGAGCAAGTCGATGCTCTACCTCGAATCGCGCTGCATCTTCATTACTAAAGGCGCCGGGGTTCA
GGGACTGCAAAACGGCGCGGTGAGCTGTATCGGCATGACCGGCGCTGTGCCGTCGGGCATTCGG
GCGGTGCTGGCGGAAAACCTGATCGCCTCTATGCTCGACCTCGAAGTGGCGTCCGCCAACGACC
AGACTTTCTCCCACTCGGATATTCGCCGCACCGCGCGCACCCTGATGCAGATGCTGCCGGGCAC
CGACTTTATTTTCTCCGGCTACAGCGCGGTGCCGAACTACGACAACATGTTCGCCGGCTCGAAC
TTCGATGCGGAAGATTTTGATGATTACAACATCCTGCAGCGTGACCTGATGGTTGACGGCGGCC
TGCGTCCGGTGACCGAGGCGGAAACCATTGCCATTCGCCAGAAAGCGGCGCGGGCGATCCAGGC
GGTTTTCCGCGAGCTGGGGCTGCCGCCAATCGCCGACGAGGAGGTGGAGGCCGCCACCTACGCG
CACGGCAGCAACGAGATGCCGCCGCGTAACGTGGTGGAGGATCTGAGTGCGGTGGAAGAGATGA
TGAAGCGCAACATCACCGGCCTCGATATTGTCGGCGCGCTGAGCCGCAGCGGCTTTGAGGATAT
CGCCAGCAATATTCTCAATATGCTGCGCCAGCGGGTCACCGGCGATTACCTGCAGACCTCGGCC
ATTCTCGATCGGCAGTTCGAGGTGGTGAGTGCGGTCAACGACATCAATGACTATCAGGGGCCGG
GCACCGGCTATCGCATCTCTGCCGAACGCTGGGCGGAGATCAAAAATATTCCGGGCGTGGTTCA
GCCCGACACCATTGAATAAGGCGGTATTCCTGTGCAACAGACAACCCAAATTCAGCCCTCTTTT
ACCCTGAAAACCCGCGAGGGCGGGGTAGCTTCTGCCGATGAACGCGCCGATGAAGTGGTGATCG
GCGTCGGCCCTGCCTTCGATAAACACCAGCATCACACTCTGATCGATATGCCCCATGGCGCGAT
CCTCAAAGAGCTGATTGCCGGGGTGGAAGAAGAGGGGCTTCACGCCCGGGTGGTGCGCATTCTG
CGCACGTCCGACGTCTCCTTTATGGCCTGGGATGCGGCCAACCTGAGCGGCTCGGGGATCGGCA
TCGGTATCCAGTCGAAGGGGACCACGGTCATCCATCAGCGCGATCTGCTGCCGCTCAGCAACCT
GGAGCTGTTCTCCCAGGCGCCGCTGCTGACGCTGGAGACCTACCGGCAGATTGGCAAAAACGCT
GCGCGCTATGCGCGCAAAGAGTCACCTTCGCCGGTGCCGGTGGTGAACGATCAGATGGTGCGGC
CGAAATTTATGGCCAAAGCCGCGCTATTTCATATCAAAGAGACCAAACATGTGGTGCAGGACGC
CGAGCCCGTCACCCTGCACATCGACTTAGTAAGGGAGTGACCATGAGCGAGAAAACCATGCGCG
TGCAGGATTATCCGTTAGCCACCCGCTGCCCGGAGCATATCCTGACGCCTACCGGCAAACCATT
GACCGATATTACCCTCGAGAAGGTGCTCTCTGGCGAGGTGGGCCCGCAGGATGTGCGGATCTCC
CGCCAGACCCTTGAGTACCAGGCGCAGATTGCCGAGCAGATGCAGCGCCATGCGGTGGCGCGCA
ATTTCCGCCGCGCGGCGGAGCTTATCGCCATTCCTGACGAGCGCATTCTGGCTATCTATAACGC
GCTGCGCCCGTTCCGCTCCTCGCAGGCGGAGCTGCTGGCGATCGCCGACGAGCTGGAGCACACC
TGGCATGCGACAGTGAATGCCGCCTTTGTCCGGGAGTCGGCGGAAGTGTATCAGCAGCGGCATA
AGCTGCGTAAAGGAAGCTAAGCGGAGGTCAGCATGCCGTTAATAGCCGGGATTGATATCGGCAA
CGCCACCACCGAGGTGGCGCTGGCGTCCGACTACCCGCAGGCGAGGGCGTTTGTTGCCAGCGGG
ATCGTCGCGACGACGGGCATGAAAGGGACGCGGGACAATATCGCCGGGACCCTCGCCGCGCTGG
AGCAGGCCCTGGCGAAAACACCGTGGTCGATGAGCGATGTCTCTCGCATCTATCTTAACGAAGC

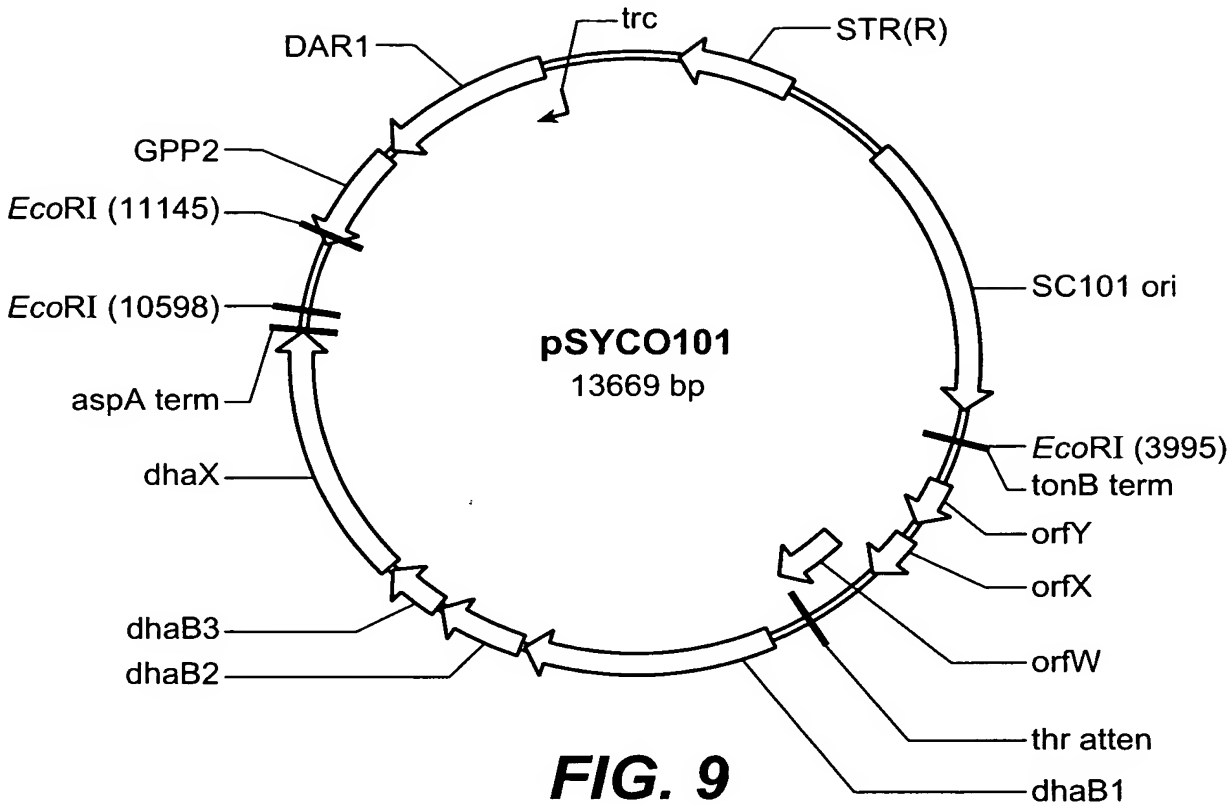
FIG. 8C

CGCGCCGGTGATTGGCGATGTGGCGATGGAGACCATCACCGAGACCATTATCACCGAATCGACC
ATGATCGGTCATAACCCGCAGACGCCGGGCGGGGTGGGCGTTGGCGTGGGGACGACTATCGCCC
TCGGGCGGCTGGCGACGCTGCCGGCGGCGCAGTATGCCGAGGGGTGGATCGTACTGATTGACGA
CGCCGTCGATTTCCTTGACGCCGTGTGGTGGCTCAATGAGGCGCTCGACCGGGGGATCAACGTG
GTGGCGGCGATCCTCAAAAAGGACGACGGCGTGCTGGTGAACAACCGCCTGCGTAAAACCCTGC
CGGTGGTGGATGAAGTGACGCTGCTGGAGCAGGTCCCCGAGGGGGTAATGGCGGCGGTGGAAGT
GGCCGCGCCGGGCCAGGTGGTGCGGATCCTGTCGAATCCCTACGGGATCGCCACCTTCTTCGGG
CTAAGCCCGGAAGAGACCCAGGCCATCGTCCCCATCGCCCGCGCCCTGATTGGCAACCGTTCCG
CGGTGGTGCTCAAGACCCCGCAGGGGGATGTGCAGTCGCGGGTGATCCCGGCGGGCAACCTCTA
CATTAGCGGCGAAAAGCGCCGCGGAGAGGCCGATGTCGCCGAGGGCGCGGAAGCCATCATGCAG
GCGATGAGCGCCTGCGCTCCGGTACGCGACATCCGCGGCGAACCGGGCACCCACGCCGGCGGCA
TGCTTGAGCGGGTGCGCAAGGTAATGGCGTCCCTGACCGGCCATGAGATGAGCGCGATATACAT
CCAGGATCTGCTGGCGGTGGATACGTTTATTCCGCGCAAGGTGCAGGGCGGGATGGCCGGCGAG
TGCGCCATGGAGAATGCCGTCGGGATGGCGGCGATGGTGAAAGCGGATCGTCTGCAAATGCAGG
TTATCGCCCGCGAACTGAGCGCCCGACTGCAGACCGAGGTGGTGGTGGGCGGCGTGGAGGCCAA
CATGGCCATCGCCGGGGCGTTAACCACTCCCGGCTGTGCGGCGCCGCTGGCGATCCTCGACCTC
GGCGCCGGCTCGACGGATGCGGCGATCGTCAACGCGGAGGGGCAGATAACGGCGGTCCATCTCG
CCGGGGCGGGGAATATGGTCAGCCTGTTGATTAAAACCGAGCTGGGCCTCGAGGATCTTTCGCT
GGCGGAAGCGATAAAAAAATACCCGCTGGCCAAAGTGGAAAGCCTGTTCAGTATTCGTCACGAG
AATGGCGCGGTGGAGTTCTTTCGGGAAGCCCTCAGCCCGGCGGTGTTCGCCAAAGTGGTGTACA
TCAAGGAGGGCGAACTGGTGCCGATCGATAACGCCAGCCCGCTGGAAAAAATTCGTCTCGTGCG
CCGGCAGGCGAAAGAGAAAGTGTTTGTCACCAACTGCCTGCGCGCGCTGCGCCAGGTCTCACCC
GGCGGTTCCATTCGCGATATCGCCTTTGTGGTGCTGGTGGGCGGCTCATCGCTGGACTTTGAGA
TCCCGCAGCTTATCACGGAAGCCTTGTCGCACTATGGCGTGGTCGCCGGGCAGGGCAATATTCG
GGGAACAGAAGGGCCGCGCAATGCGGTCGCCACCGGGCTGCTACTGGCCGGTCAGGCGAATTAA
ACGGGCGCTCGCGCCAGCCTCTAGGTACAAATAAAAAAGGCACGTCAGATGACGTGCCTTTTTT
CTTGTCTAGAGTACTGGCGAAAGGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGGG
TTTTCCCAGTCACGACGTTGTAAAACGACGGCCAGTGAATTCGAGCTCGGTACCCGGGGCGGCC
GCGCTAGCGCCCGATCCAGCTGGAGTTTGTAGAAACGCAAAAAGGCCATCCGTCAGGATGGCCT
TCTGCTTAATTTGATGCCTGGCAGTTTATGGCGGGCGTCCTGCCCGCCACCCTCCGGGCCGTTG
CTTCGCAACGTTCAAATCCGCTCCCGGCGGATTTGTCCTACTCAGGAGAGCGTTCACCGACAAA
CAACAGATAAAACGAAAGGCCCAGTCTTTCGACTGAGCCTTTCGTTTTATTTGATGCCTGGCAG
TTCCCTACTCTCGCATGGGGAGACCCCACACTACCATCGGCGCTACGGCGTTTCACTTCTGAGT
TCGGCATGGGGTCAGGTGGGACCACCGCGCTACTGCCGCCAGGCAAATTCTGTTTTATCAGACC
GCTTCTGCGTTCTGATTTAATCTGTATCAGGCTGAAAATCTTCTCTCATCCGCCAAAACAGCCA
AGCTTGCATGCCTGCAGCCCGGGTTACCATTTCAACAGATCGTCCTTAGCATATAAGTAGTCGT
CAAAAATGAATTCAACTTCGTCTGTTTCGGCATTGTAGCCGCCAACTCTGATGGATTCGTGGTT
TTTGACAATGATGTCACAGCCTTTTTCCTTTAGGAAGTCCAAGTCGAAAGTAGTGGCAATACCA
ATGATCTTACAACCGGCGGCTTTTCCGGCGGCAATACCTGCTGGAGCGTCTTCAAATACTACTA
CCTTAGATTTGGAAGGGTCTTGCTCATTGATCGGATATCCTAAGCCATTCCTGCCCTTCAGATA
TGGTTCTGGATGAGGCTTACCCTGTTTGACATCATTAGCGGTAATGAAGTACTTTGGTCTCCTG
ATTCCCAGATGCTCGAACCATTTTTGTGCCATATCACGGGTACCGGAAGTTGCCACAGCCCATT
TCTCTTTTGGTAGAGCGTTCAAAGCGTTGCACAGCTTAACTGCACCTGGGACTTCAATGGATTT
TTCACCGTACTTGACCGGAATTTCAGCTTCTAATTTGTTAACATACTCTTCATTGGCAAAGTCT
GGAGCGAACTTAGCAATGGCATCAAACGTTCTCCAACCATGCGAGACTTGGATAACGTGTTCAG
CATCGAAATAAGGTTTGTCCTTACCGAAATCCCTCCAGAATGCAGCAATGGCTGGTTGAGAGAT

FIG. 8D

GATAATGGTACCGTCGACGTCGAACAAAGCGGCGTTAACTTTCAAAGATAGAGGTTTAGTAGTC
AATCCCATAATTCTAGTCTGTTTCCTGGATCCAATAAATCTAATCTTCATGTAGATCTAATTCT
TCAATCATGTCCGGCAGGTTCTTCATTGGGTAGTTGTTGTAAACGATTTGGTATACGGCTTCAA
ATAATGGGAAGTCTTCGACAGAGCCACATGTTTCCAACCATTCGTGAACTTCTTTGCAGGTAAT
TAAACCTTGAGCGGATTGGCCATTCAACAACTCCTTTTCACATTCCCAGGCGTCCTTACCAGAA
GTAGCCATTAGCCTAGCAACCTTGACGTTTCTACCACCAGCGCAGGTGGTGATCAAATCAGCAA
CACCAGCAGACTCTTGGTAGTATGTTTCTTCTCTAGATTCTGGGAAAAACATTTGACCGAATCT
GATGATCTCACCCAAACCGACTCTTTGGATGGCAGCAGAAGCGTTGTTACCCCAGCCTAGACCT
TCGACGAAACCACAACCTAAGGCAACAACGTTCTTCAAAGCACCACAGATGGAGATACCAGCAA
CATCTTCGATGACACTAACGTGGAAGTAAGGTCTGTGGAACAAGGCCTTTAGAACCTTATGGTC
GACGTCCTTGCCCTCGCCTCTGAAATCCTTTGGAATGTGGTAAGCAACTGTTGTTTCAGACCAG
TGTTCTTGAGCGACTTCGGTGGCAATGTTAGCACCAGATAGAGCACCACATTGAATACCTAGTT
CCTCAGTGATGTAAGAGGATAGCAATTGGACACCTTTAGCACCAACTTCAAAACCCTTTAGACA
GGAGATAGCTCTGACGTGTGAATCAACATGACCTTTCAATTGGCTACAGATACGGGGCAAAAAT
TGATGTGGAATGTTGAAAACGATGATGTCGACATCCTTGACTGAATCAATCAAGTCTGGATTAG
CAACCAAATTGTCGGGTAGAGTGATGCCAGGCAAGTATTTCACGTTTTGATGTCTAGTATTTAT
GATTTCAGTCAATTTTTCACCATTGATCTCTTCTTCGAACACCCACATTTGTACTATTGGAGCG
AAAACTTCTGGGTATCCCTTACAATTTTCGGCAACCACCTTGGCAATAGTAGTACCCCAGTTAC
CAGATCCAATCACAGTAACCTTGAAAGGCTTTTCGGCAGCCTTCAAAGAAACAGAAGAGGAACT
TCTCTTTCTACCAGCATTCAAGTGGCCGGAAGTTAAGTTTAATCTATCAGCAGCAGCAGCCATG
GAATTGTCCTCCTTACTAGTCATGGTCTGTTTCCTGTGTGAAATTGTTATCCGCTCACAATTCC
ACACATTATACGAGCCGGATGATTAATTGTCAACAGCTCATTTCAGAATATTTGCCAGAACCGT
TATGATGTCGGCGCAAAAAACATTATCCAGAACGGGAGTGCGCCTTGAGCGACACGAATTATGC
AGTGATTTACGACCTGCACAGCCATACCACAGCTTCCGATGGCTGCCTGACGCCAGAAGCATTG
GTGCACGCTAGCCAGTACATTTAAATGGTACCCTCTAGTCAAGGCCTTAAGTGAGTCGTATTAC
GGACTGGCCGTCGTTTTACAACGTCGTGACTGGGAAAACCCTGGCGTTACCCAACTTAATCGCC
TTGCAGCACATCCCCCTTTCGCCAGCTGGCGTAATAGCGAAGAGGCCCGCACCGATCGCCCTTC
CCAACAGTTGCGCAGCCTGAATGGCGAATGGCGCCTGATGCGGTATTTTCTCCTTACGCATCTG
TGCGGTATTTCACACCGCATATGGTGCACTCTCAGTACAATCTGCTCTGATGCCGCATAGTTAA
GCCAGCCCCGACACCCGCCAACACCCGCTGACGAGCT

FIG. 8E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STR(R)
DAR1
GPP2
EcoRI (11145)
EcoRI (10598)
aspA term
dhaX
dhaB3
dhaB2
pSYCO101
13669 bp
SC101 ori
EcoRI (3995)
tonB term
orfY
orfX
orfW
thr atten
dhaB1

FIG. 9

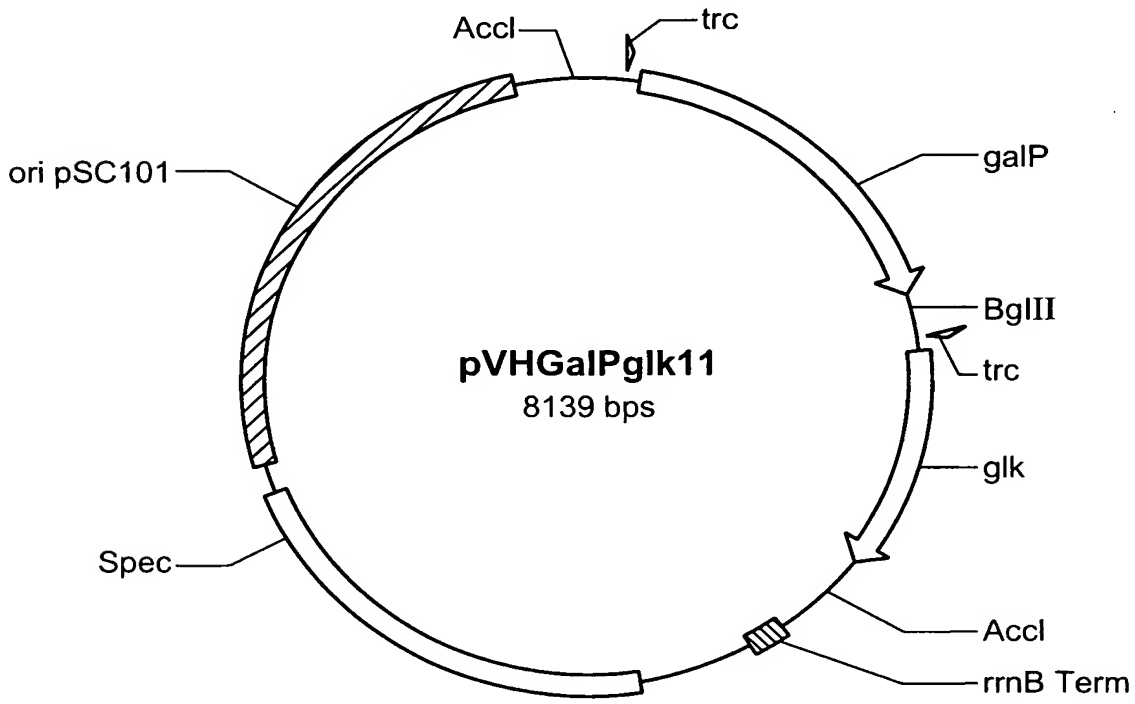

AccI
trc
ori pSC101
galP
BglII
trc
pVHGalPglk11
8139 bps
glk
Spec
AccI
rrnB Term

FIG. 13

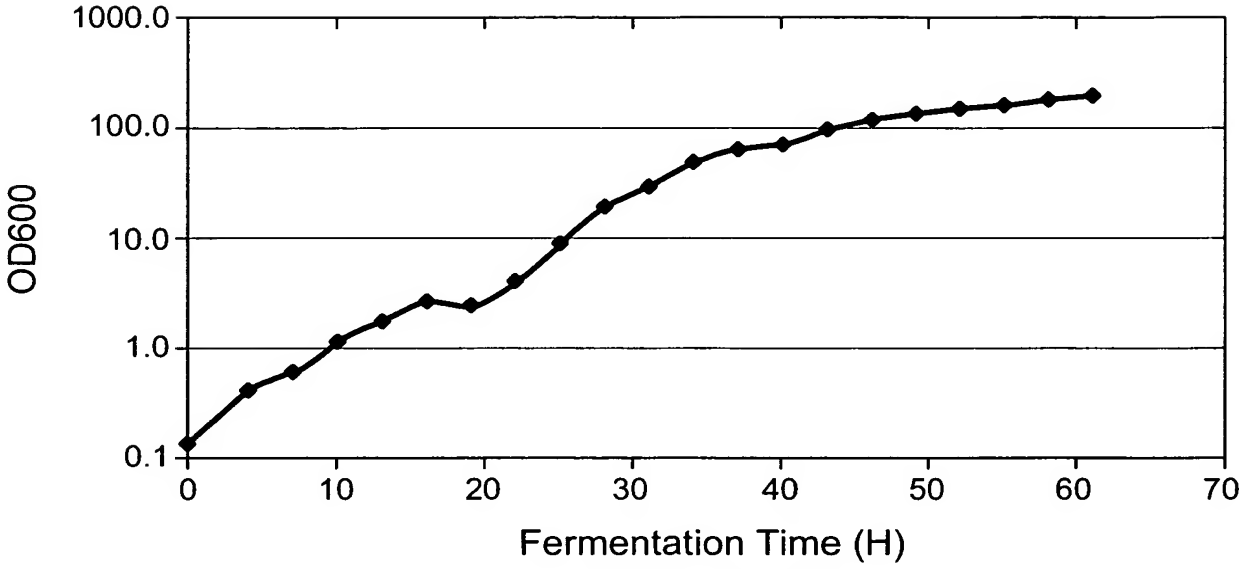


FIG. 10A

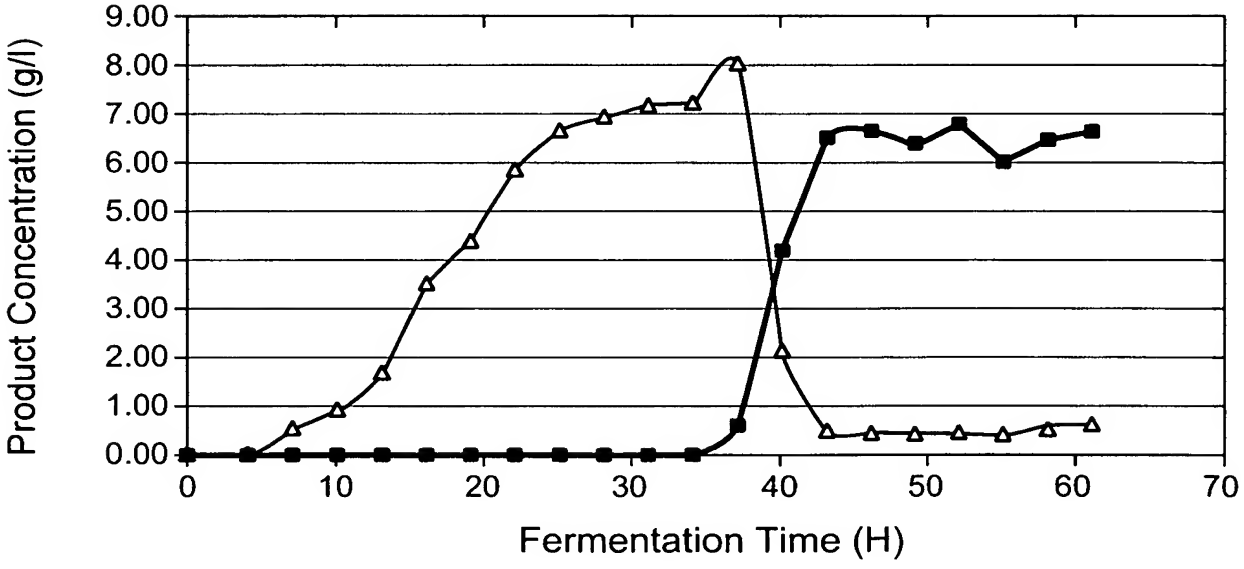


FIG. 10B

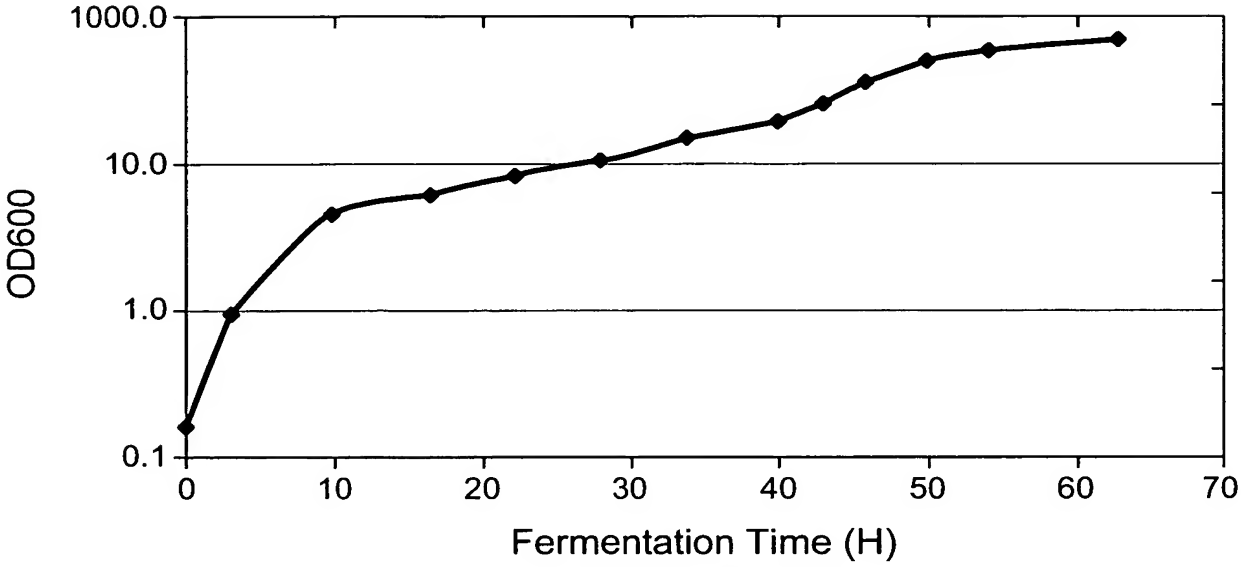


FIG. 11A

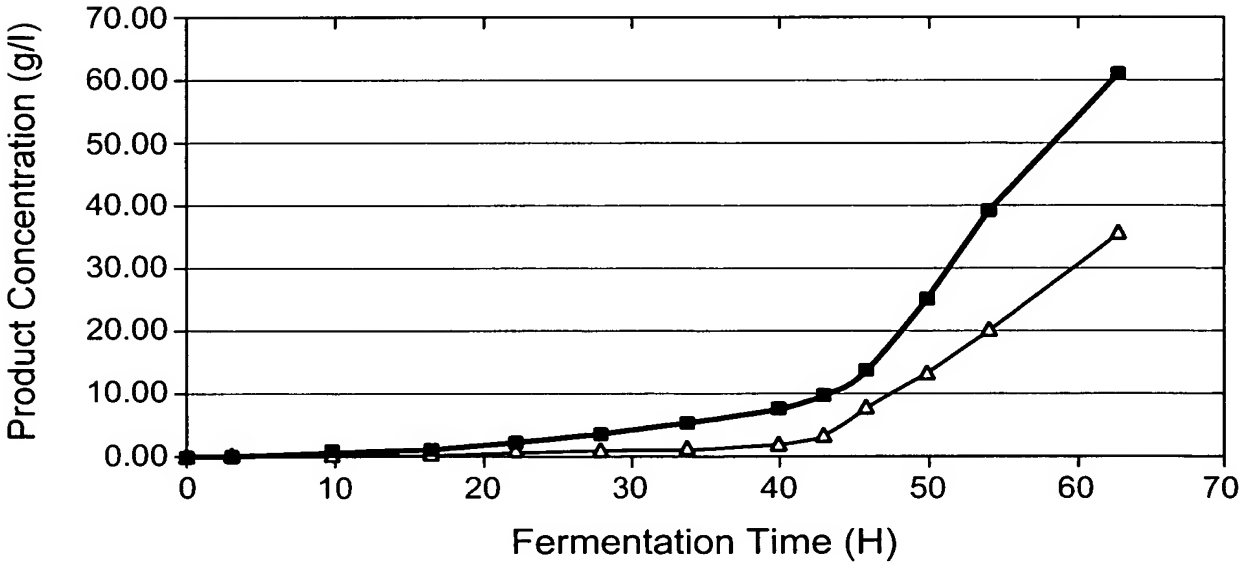


FIG. 11B

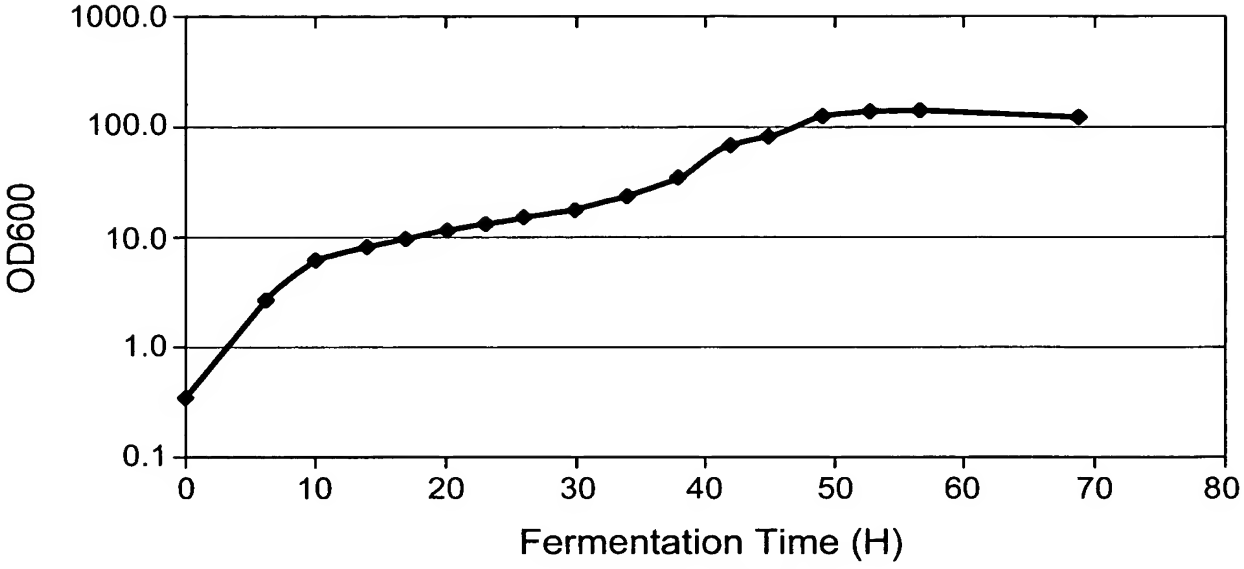


FIG. 12A

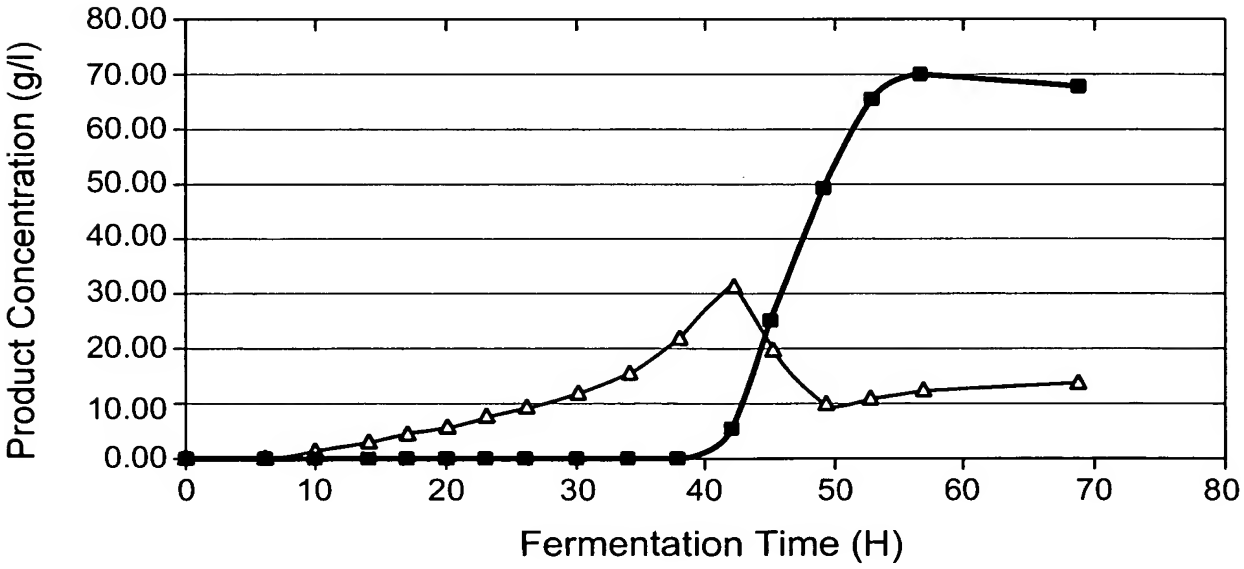


FIG. 12B


GTCGACTCTAGAGGATCTCGAGCGGCCGCCAGTGTGATGGATATCTGCAGAATTCGCCCTTGGAAGCTGTGGTATGGCTGTGCAGGTCGTAAATCACTGC 100
CAGCTGAGATCTCCTAGAGCTCGCCGGCGGTCACACTACCTATAGACGTCTTAAGCGGGAACCTTCGACACCATACCGACACGTCCAGCATTTAGTGACG
ATAATTCGTGTCGCTCAAGGCGCACTCCCGTTCTGGATAATGTTTTTTGCGCCGACATCATAACGGTTCTGGCAAATATTCTGAAATGAGCTGTTGACAA 200
TATTAAGCACAGCGAGTTCCGCGTGAGGGCAAGACCTATTACAAAAAACGCGGCTGTAGTATTGCCAAGACCGTTTATAAGACTTTACTCGACAACTGTT
Trc Pro -
TTAATCATCCGGCTCGTATAATGTGTGGAATTGTGAGCGGATAACAATTTCACACAGGAAACAGACCATGCCTGACGCTAAAAAACAGGGGCGGTCAAAC 300
AATTAGTAGGCCGAGCATATTACACACCTTAACACTCGCCTATTGTTAAAGTGTGTCCTTTGTCTGGTACGGACTGCGATTTTTTGTCCCCGCCAGTTTG
Trc Promoter
Met Pro Asp Ala Lys Lys Gln Gly Arg Ser Asn
galP
AAGGCAATGACGTTTTTCGTCTGCTTCCTTGCCGCTCTGGCGGGATTACTCTTTGGCCTGGATATCGGTGTAATTGCTGGCGCACTGCCGTTTATTGCAG 400
TTCCGTTACTGCAAAAAGCAGACGAAGGAACGGCGAGACCGCCCTAATGAGAAACCGGACCTATAGCCACATTAACGACCGCGTGACGGCAAATAACGTC
Lys Ala Met Thr Phe Phe Val Cys Phe Leu Ala Ala Leu Ala Gly Leu Leu Phe Gly Leu Asp Ile Gly Val Ile Ala Gly Ala Leu Pro Phe Ile Ala
galP
ATGAATTCCAGATTACTTCGCACACGCAAGAATGGGTCGTAAGCTCCATGATGTTCGGTGCGGCAGTCGGTGCGGTGGGCAGCGGCTGGCTCTCCTTTAA 500
TACTTAAGGTCTAATGAAGCGTGTGCGTTCTTACCCAGCATTCGAGGTACTACAAGCCACGCCGTCAGCCACGCCACCCGTCGCCGACCGAGAGGAAATT
Asp Glu Phe Gln Ile Thr Ser His Thr Gln Glu Trp Val Val Ser Ser Met Met Phe Gly Ala Ala Val Gly Ala Val Gly Ser Gly Trp Leu Ser Phe Lys
galP
ACTCGGGCGCAAAAAGAGCCTGATGATCGGCGCAATTTTGTTTGTTGCCGGTTCGCTGTTCTCTGCGGCTGCGCCAAACGTTGAAGTACTGATTCTTTCC 600
TGAGCCCGCGTTTTTCTCGGACTACTAGCCGCGTTAAAACAAACAACGGCCAAGCGACAAGAGACGCCGACGCGGTTTGCAACTTCATGACTAAGAAAGG
Leu Gly Arg Lys Lys Ser Leu Met Ile Gly Ala Ile Leu Phe Val Ala Gly Ser Leu Phe Ser Ala Ala Ala Pro Asn Val Glu Val Leu Ile Leu Ser
galP
CGCGTTCTACTGGGGCTGGCGGTGGGTGTGGCCTCTTATACCGCACCGCTGTACCTCTCTGAAATTGCGCCGGAAAAAATTCGTGGCAGTATGATCTCGA 700
GCGCAAGATGACCCCGACCGCCACCCACACCGGAGAATATGGCGTGGCGACATGGAGAGACTTTAACGCGGCCTTTTTTAAGCACCGTCATACTAGAGCT
Arg Val Leu Leu Gly Leu Ala Val Gly Val Ala Ser Tyr Thr Ala Pro Leu Tyr Leu Ser Glu Ile Ala Pro Glu Lys Ile Arg Gly Ser Met Ile Ser
galP

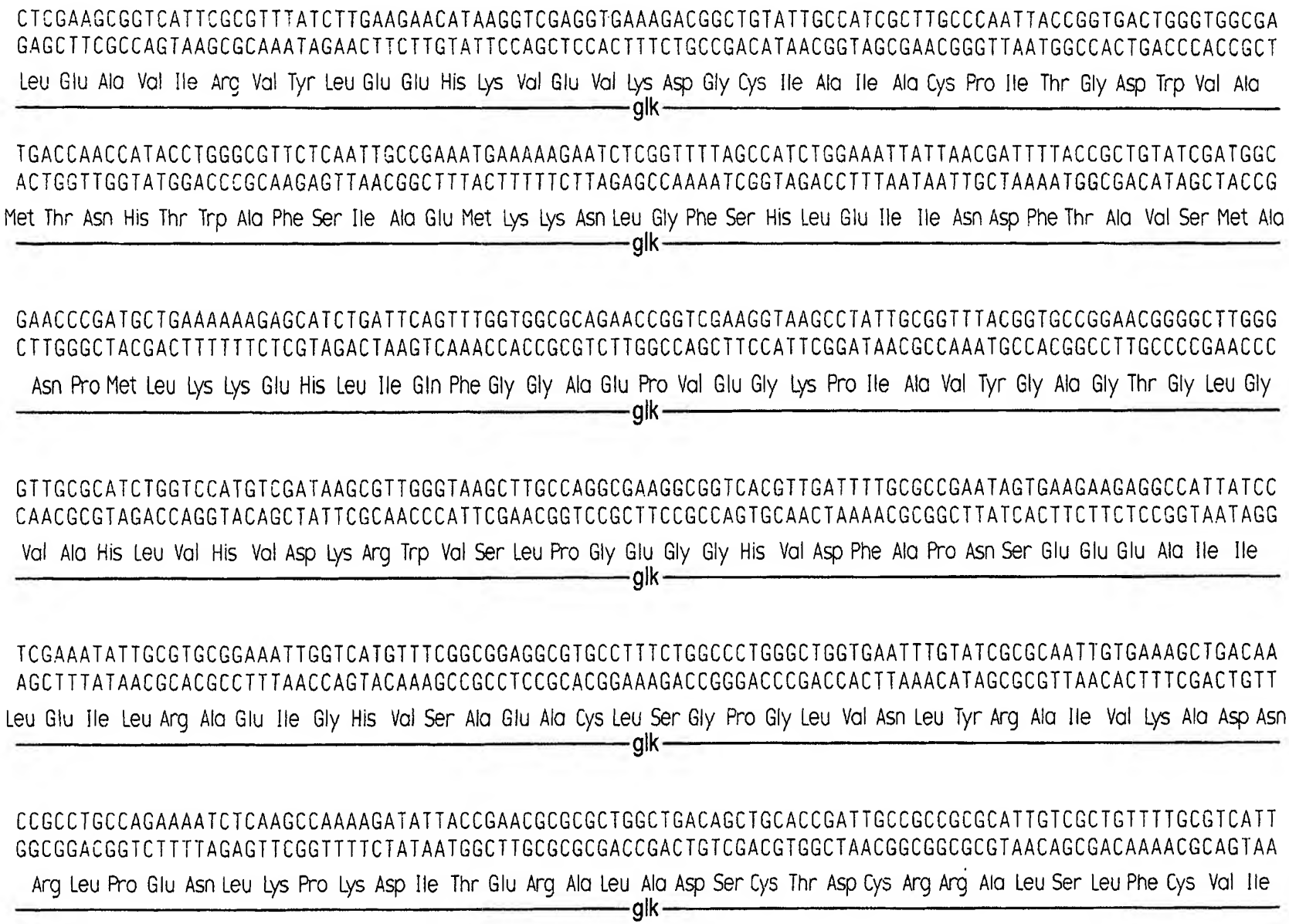
FIG. 14A

```
TGTATCAGTTGATGATCACTATCGGGATCCTCGGTGCTTATCTTTCTGATACCGCCTTCAGCTACACCGGTGCATGGCGCTGGATGCTGGGTGTGATTAT 800
ACATAGTCAACTACTAGTGATAGCCCTAGGAGCCACGAATAGAAAGACTATGGCGGAAGTCGATGTGGCCACGTACCGCGACCTACGACCCACACTAATA
Met Tyr Gln Leu Met Ile Thr Ile Gly Ile Leu Gly Ala Tyr Leu Ser Asp Thr Ala Phe Ser Tyr Thr Gly Ala Trp Arg Trp Met Leu Gly Val Ile Ile
                                                    galP

CATCCCGGCAATTTTGCTGCTGATTGGTGTCTTCTTCCTGCCAGACAGCCCACGTTGGTTTGCCGCCAAACGCCGTTTTGTTGATGCCGAACGCGTGCTG 900
GTAGGGCCGTTAAAACGACGACTAACCACAGAAGAAGGACGGTCTGTCGGGTGCAACCAAACGGCGGTTTGCGGCAAAACAACTACGGCTTGCGCACGAC
  Ile Pro Ala Ile Leu Leu Leu Ile Gly Val Phe Phe Leu Pro Asp Ser Pro Arg Trp Phe Ala Ala Lys Arg Arg Phe Val Asp Ala Glu Arg Val Leu
                                                    galP

CTACGCCTGCGTGACACCAGCGCGGAAGCGAAACGCGAACTGGATGAAATCCGTGAAAGTTTGCAGGTTAAACAGAGTGGCTGGGCGCTGTTTAAAGAGA 1000
GATGCGGACGCACTGTGGTCGCGCCTTCGCTTTGCGCTTGACCTACTTTAGGCACTTTCAAACGTCCAATTTGTCTCACCGACCCGCGACAAATTTCTCT
Leu Arg Leu Arg Asp Thr Ser Ala Glu Ala Lys Arg Glu Leu Asp Glu Ile Arg Glu Ser Leu Gln Val Lys Gln Ser Gly Trp Ala Leu Phe Lys Glu
                                                    galP

ACAGCAACTTCCGCCGCGCGGTGTTCCTTGGCGTACTGTTGCAGGTAATGCAGCAATTCACCGGGATGAACGTCATCATGTATTACGCGCCGAAAATCTT 1100
TGTCGTTGAAGGCGGCGCGCCACAAGGAACCGCATGACAACGTCCATTACGTCGTTAAGTGGCCCTACTTGCAGTAGTACATAATGCGCGGCTTTTAGAA
Asn Ser Asn Phe Arg Arg Ala Val Phe Leu Gly Val Leu Leu Gln Val Met Gln Gln Phe Thr Gly Met Asn Val Ile Met Tyr Tyr Ala Pro Lys Ile Phe
                                                    galP

CGAACTGGCGGGTTATACCAACACTACCGAGCAAATGTGGGGGACCGTGATTGTCGGCCTGACCAACGTACTTGCCACCTTTATCGCAATCGGCCTTGTT 1200
GCTTGACCGCCCAATATGGTTGTGATGGCTCGTTTACACCCCCTGGCACTAACAGCCGGACTGGTTGCATGAACGGTGGAAATAGCGTTAGCCGGAACAA
  Glu Leu Ala Gly Tyr Thr Asn Thr Thr Glu Gln Met Trp Gly Thr Val Ile Val Gly Leu Thr Asn Val Leu Ala Thr Phe Ile Ala Ile Gly Leu Val
                                                    galP

GACCGCTGGGGACGTAAACCAACGCTAACGCTGGGCTTCCTGGTGATGGCTGCTGGCATGGGCGTACTCGGTACAATGATGCATATCGGTATTCACTCTC 1300
CTGGCGACCCCTGCATTTGGTTGCGATTGCGACCCGAAGGACCACTACCGACGACCGTACCCGCATGAGCCATGTTACTACGTATAGCCATAAGTGAGAG
  Asp Arg Trp Gly Arg Lys Pro Thr Leu Thr Leu Gly Phe Leu Val Met Ala Ala Gly Met Gly Val Leu Gly Thr Met Met His Ile Gly Ile His Ser
                                                    galP

CGTCGGCGCAGTATTTCGCCATCGCCATGCTGCTGATGTTTATTGTCGGTTTTGCCATGAGTGCCGGTCCGCTGATTTGGGTACTGTGCTCCGAAATTCA 1400
GCAGCCGCGTCATAAAGCGGTAGCGGTACGACGACTACAAATAACAGCCAAAACGGTACTCACGGCCAGGCGACTAAACCCATGACACGAGGCTTTAAGT
Pro Ser Ala Gln Tyr Phe Ala Ile Ala Met Leu Leu Met Phe Ile Val Gly Phe Ala Met Ser Ala Gly Pro Leu Ile Trp Val Leu Cys Ser Glu Ile Gln
                                                    galP
```

FIG. 14B


GCCGCTGAAAGGCCGCGATTTTGGCATCACCTGCTCCACTGCCACCAACTGGATTGCCAACATGATCGTTGGCGCAACGTTCCTGACCATGCTCAACACG 1500
CGGCGACTTTCCGGCGCTAAAACCGTAGTGGACGAGGTGACGGTGGTTGACCTAACGGTTGTACTAGCAACCGCGTTGCAAGGACTGGTACGAGTTGTGC
Pro Leu Lys Gly Arg Asp Phe Gly Ile Thr Cys Ser Thr Ala Thr Asn Trp Ile Ala Asn Met Ile Val Gly Ala Thr Phe Leu Thr Met Leu Asn Thr
galP
CTGGGTAACGCCAACACCTTCTGGGTGTATGCGGCTCTGAACGTACTGTTTATCCTGCTGACATTGTGGCTGGTACCGGAAACCAAACACGTTTCGCTGG 1600
GACCCATTGCGGTTGTGGAAGACCCACATACGCCGAGACTTGCATGACAAATAGGACGACTGTAACACCGACCATGGCCTTTGGTTTGTGCAAAGCGACC
Leu Gly Asn Ala Asn Thr Phe Trp Val Tyr Ala Ala Leu Asn Val Leu Phe Ile Leu Leu Thr Leu Trp Leu Val Pro Glu Thr Lys His Val Ser Leu
galP
AACATATTGAACGTAATCTGATGAAAGGTCGTAAACTGCGCGAAATAGGCGCTCACGATTAATCTCCCCAAGCTTCCTCCCATCGCGGAGGAAACCACCT 1700
TTGTATAACTTGCATTAGACTACTTTCCAGCATTTGACGCGCTTTATCCGCGAGTGCTAATTAGAGGGGTTCGAAGGAGGGTAGCGCCTCCTTTGGTGGA
Glu His Ile Glu Arg Asn Leu Met Lys Gly Arg Lys Leu Arg Glu Ile Gly Ala His Asp •
galP
CTTGCAGTCATCTTTTCTTCGCTCTATCCTCTGCCGCTAATCCATATGACTAGATCTGCAGAATTCGCCCTTAAGGAAGCTGTGGTATGGCTGTGCAGGT 1800
GAACGTCAGTAGAAAAGAAGCGAGATAGGAGACGGCGATTAGGTATACTGATCTAGACGTCTTAAGCGGGAATTCCTTCGACACCATACCGACACGTCCA
CGTAAATCACTGCATAATTCGTGTCGCTCAAGGCGCACTCCCGTTCTGGATAATGTTTTTTGCGCCGACATCATAACGGTTCTGGCAAATATTCTGAAAT 1900
GCATTTAGTGACGTATTAAGCACAGCGAGTTCCGCGTGAGGGCAAGACCTATTACAAAAAACGCGGCTGTAGTATTGCCAAGACCGTTTATAAGACTTTA
GAGCTGTTGACAATTAATCATCCGGCTCGTATAATGTGTGGAATTGTGAGCGGATAACAATTTCACACAGGAAACAGACCATGACAAAGTATGCATTAGT 2000
CTCGACAACTGTTAATTAGTAGGCCGAGCATATTACACACCTTAACACTCGCCTATTGTTAAAGTGTGTCCTTTGTCTGGTACTGTTTCATACGTAATCA
Trc promoter
Met Thr Lys Tyr Ala Leu Val
glk
CGGTGATGTGGGCGGCACCAACGCACGTCTTGCTCTGTGTGATATTGCCAGTGGTGAAATCTCGCAGGCTAAGACCTATTCAGGGCTTGATTACCCCAGC 2100
GCCACTACACCCGCCGTGGTTGCGTGCAGAACGAGACACACTATAACGGTCACCACTTTAGAGCGTCCGATTCTGGATAAGTCCCGAACTAATGGGGTCG
Gly Asp Val Gly Gly Thr Asn Ala Arg Leu Ala Leu Cys Asp Ile Ala Ser Gly Glu Ile Ser Gln Ala Lys Thr Tyr Ser Gly Leu Asp Tyr Pro Ser
glk

FIG. 14C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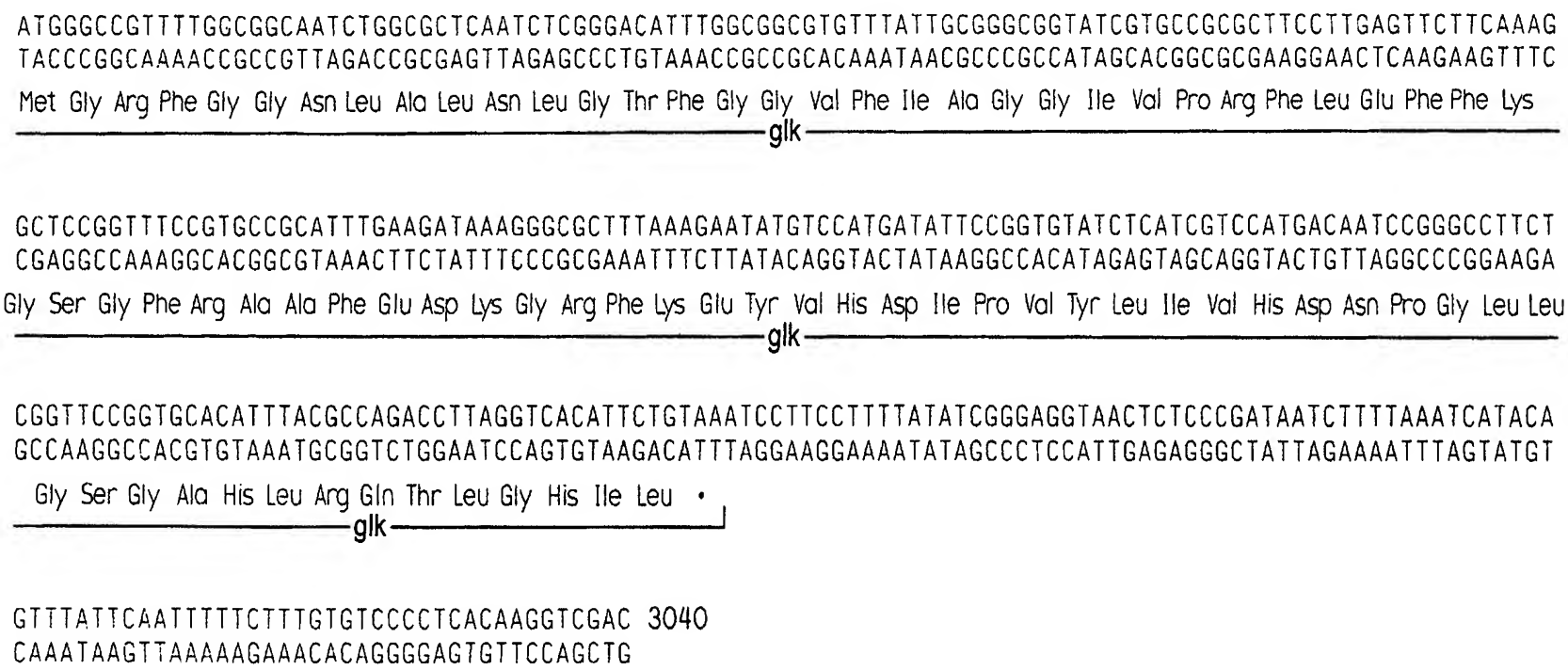
GAGCTTCGCCAGTAAGCGCAAATAGAACTTCTTGTATTCCAGCTCCACTTTCTGCCGACATAACGGTAGCGAACGGGTTAATGGCCACTGACCCACCGCT
Leu Glu Ala Val Ile Arg Val Tyr Leu Glu Glu His Lys Val Glu Val Lys Asp Gly Cys Ile Ala Ile Ala Cys Pro Ile Thr Gly Asp Trp Val Ala
glk
TGACCAACCATACCTGGGCGTTCTCAATTGCCGAAATGAAAAAGAATCTCGGTTTTAGCCATCTGGAAATTATTAACGATTTTACCGCTGTATCGATGGC 2300
ACTGGTTGGTATGGACCCGCAAGAGTTAACGGCTTTACTTTTTCTTAGAGCCAAAATCGGTAGACCTTTAATAATTGCTAAAATGGCGACATAGCTACCG
Met Thr Asn His Thr Trp Ala Phe Ser Ile Ala Glu Met Lys Lys Asn Leu Gly Phe Ser His Leu Glu Ile Ile Asn Asp Phe Thr Ala Val Ser Met Ala
glk
GAACCCGATGCTGAAAAAAGAGCATCTGATTCAGTTTGGTGGCGCAGAACCGGTCGAAGGTAAGCCTATTGCGGTTTACGGTGCCGGAACGGGGCTTGGG 2400
CTTGGGCTACGACTTTTTTCTCGTAGACTAAGTCAAACCACCGCGTCTTGGCCAGCTTCCATTCGGATAACGCCAAATGCCACGGCCTTGCCCCGAACCC
Asn Pro Met Leu Lys Lys Glu His Leu Ile Gln Phe Gly Gly Ala Glu Pro Val Glu Gly Lys Pro Ile Ala Val Tyr Gly Ala Gly Thr Gly Leu Gly
glk
GTTGCGCATCTGGTCCATGTCGATAAGCGTTGGGTAAGCTTGCCAGGCGAAGGCGGTCACGTTGATTTTGCGCCGAATAGTGAAGAAGAGGCCATTATCC 2500
CAACGCGTAGACCAGGTACAGCTATTCGCAACCCATTCGAACGGTCCGCTTCCGCCAGTGCAACTAAAACGCGGCTTATCACTTCTTCTCCGGTAATAGG
Val Ala His Leu Val His Val Asp Lys Arg Trp Val Ser Leu Pro Gly Glu Gly Gly His Val Asp Phe Ala Pro Asn Ser Glu Glu Glu Ala Ile Ile
glk
TCGAAATATTGCGTGCGGAAATTGGTCATGTTTCGGCGGAGGCGTGCCTTTCTGGCCCTGGGCTGGTGAATTTGTATCGCGCAATTGTGAAAGCTGACAA 2600
AGCTTTATAACGCACGCCTTTAACCAGTACAAAGCCGCCTCCGCACGGAAAGACCGGGACCCGACCACTTAAACATAGCGCGTTAACACTTTCGACTGTT
Leu Glu Ile Leu Arg Ala Glu Ile Gly His Val Ser Ala Glu Ala Cys Leu Ser Gly Pro Gly Leu Val Asn Leu Tyr Arg Ala Ile Val Lys Ala Asp Asn
glk
CCGCCTGCCAGAAAATCTCAAGCCAAAAGATATTACCGAACGCGCGCTGGCTGACAGCTGCACCGATTGCCGCCGCGCATTGTCGCTGTTTTGCGTCATT 2700
GGCGGACGGTCTTTTAGAGTTCGGTTTTCTATAATGGCTTGCGCGCGACCGACTGTCGACGTGGCTAACGGCGGCGCGTAACAGCGACAAAACGCAGTAA
Arg Leu Pro Glu Asn Leu Lys Pro Lys Asp Ile Thr Glu Arg Ala Leu Ala Asp Ser Cys Thr Asp Cys Arg Arg Ala Leu Ser Leu Phe Cys Val Ile
glk

FIG. 14D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TACCCGGCAAAACCGCCGTTAGACCGCGAGTTAGAGCCCTGTAAACCGCCGCACAAATAACGCCCGCCATAGCACGGCGCGAAGGAACTCAAGAAGTTTC
Met Gly Arg Phe Gly Gly Asn Leu Ala Leu Asn Leu Gly Thr Phe Gly Gly Val Phe Ile Ala Gly Gly Ile Val Pro Arg Phe Leu Glu Phe Phe Lys
glk
GCTCCGGTTTCCGTGCCGCATTTGAAGATAAAGGGCGCTTTAAAGAATATGTCCATGATATTCCGGTGTATCTCATCGTCCATGACAATCCGGGCCTTCT 2900
CGAGGCCAAAGGCACGGCGTAAACTTCTATTTCCCGCGAAATTTCTTATACAGGTACTATAAGGCCACATAGAGTAGCAGGTACTGTTAGGCCCGGAAGA
Gly Ser Gly Phe Arg Ala Ala Phe Glu Asp Lys Gly Arg Phe Lys Glu Tyr Val His Asp Ile Pro Val Tyr Leu Ile Val His Asp Asn Pro Gly Leu Leu
glk
CGGTTCCGGTGCACATTTACGCCAGACCTTAGGTCACATTCTGTAAATCCTTCCTTTTATATCGGGAGGTAACTCTCCCGATAATCTTTTAAATCATACA 3000
GCCAAGGCCACGTGTAAATGCGGTCTGGAATCCAGTGTAAGACATTTAGGAAGGAAAATATAGCCCTCCATTGAGAGGGCTATTAGAAAATTTAGTATGT
Gly Ser Gly Ala His Leu Arg Gln Thr Leu Gly His Ile Leu •
glk
GTTTATTCAATTTTTCTTTGTGTCCCCTCACAAGGTCGAC 3040
CAAATAAGTTAAAAAGAAACACAGGGGAGTGTTCCAGCTG

FIG. 14E